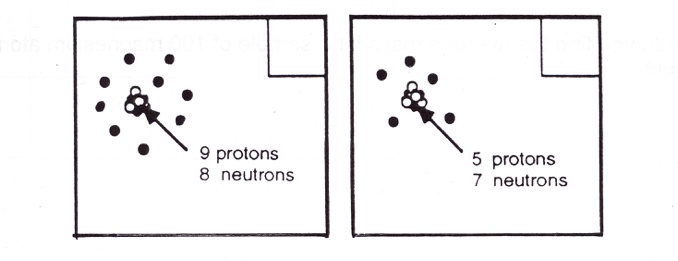
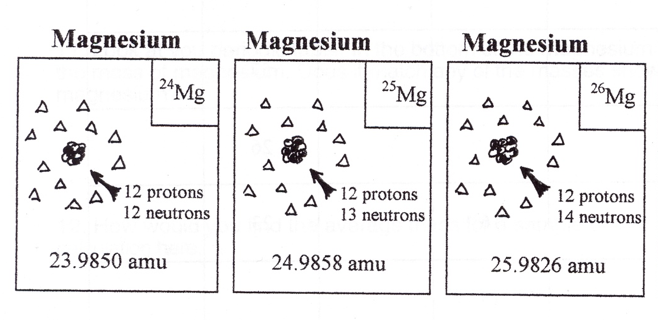
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The Inside of an Atom

***The following activity will help you learn the important aspects of an atom. How do we characterize atoms? What makes a Carbon atom different from an Oxygen atom? How are isotopes and ions related to atoms? You will need the schematic diagrams of various atoms and your periodic table to answer these questions.***

1. Look at the diagram for Carbon on the back of your periodic table handout. What do all Carbon atoms (and ions) have in common?
2. What do all of the Hydrogen atoms (and ions) have in common?
3. What do all of the Magnesium atoms (and ions) have in common?
4. Look at your Periodic Table. What whole number is in the box for each of these elements (Carbon, Hydrogen, Magnesium)? This number is called the Atomic Number. What do you think it represents?
5. How many protons are in all Chlorine atoms? Do you think Chlorine atoms exist with 16 protons? Why or why not?
6. In the bottom center of each cell in your periodic table is the **Atomic Mass** of the atom. What does it look like (decimal or whole number)?
7. On the other hand, we calculate the Mass Number (whole number) for a particular atom by adding up the protons and neutrons in that atom’s nucleus. What is the Mass Number for the following atoms shown in the diagrams?



1. Atoms of the same element that have different mass numbers are called **isotopes**. How are the Magnesium isotopes below the same? How are they different?
2. Considering what you know about isotopes, do all atoms of an element have the same mass?
3. In chemistry, it is often necessary for us to know the mass of an element. If different isotopes could randomly occur, how would you know what the mass is? First, we need to know what the likelihood of getting a certain isotope is. This is like finding your average on several tests. For this, we need a table of Natural Abundances: a table that shows us how frequently various isotopes occur in nature.

|  |  |  |
| --- | --- | --- |
| **Table of Abundances** | | |
| Isotope | Natural abundance found on earth (%) | Atomic Mass (amu) **(The amu sets Carbon at having a mass of 12.0)** |
| **1**H | 99.985 | 1.0078 |
| **2**H | 0.015 | 2.0140 |
|  |  |  |
| **12**C | 98.89 | 12.000 |
| **13**C | 1.11 | 13.0034 |
|  |  |  |
| **16**O | 99.76 | 15.9949 |
| **17**O | 0.04 | 16.9991 |
| **18**O | 0.20 | 17.9992 |
|  |  |  |
| **24**Mg | 78.99 | 23.9850 |
| **25**Mg | 10.00 | 24.9858 |
| **26**Mg | 11.01 | 25.9826 |

If you could pick up and weigh a single atom of Magnesium, the mass of that atom would probably be \_\_\_\_\_\_\_\_\_\_\_. Why?

1. Look up the atomic mass of Magnesium on the periodic table. Does it match any of the masses shown in the table of abundances for Magnesium? Why or why not?
2. Mass number (whole number) and atomic mass or atomic weight are very different things. For each of the following, indicate if the statement is referring to Mass number (mn) or atomic mass (am).
   1. Whole number
   2. Number with a decimal
   3. Found on the periodic table
   4. Refers to the mass of one particular atom
   5. Refers to the average mass of all atoms of the same element
3. Look at the drawings on the back of your periodic table. How do you recognize a neutral atom of a substance? (Hint: look at the number of protons and electrons)
4. If an ion has a -2 charge, what has been altered in the atom?
5. If an ion has a +2 charge, what has been altered in the atom?
6. Fill in the table below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Symbol | **40**K | **18**F |  | **65**Cu |  | **77**Br |
| Mass #  (whole number) |  |  |  |  | 57 |  |
| # of Protons |  |  | 16 |  | 26 |  |
| # of Electrons |  |  | 16 |  | 26 |  |
| # of Neutrons |  |  | 15 |  |  |  |

